



REMARKS/ARGUMENTS

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Briefly, applicants wish to point out the major features of their claimed invention which is a novel apparatus for jointly polishing a plurality of substrates and conditioning the polishing medium on the surface of a polishing pad. The real-time polishing and pad conditioning provides the CMP process an apparatus for improving uniformity for polishing larger substrates as well as increasing machine utilization and product throughput.

A plurality of coaxial polishing-dressing head assemblies, each holding large substrates to be polished are rotated along a central axis while urging the substrates and the coaxially mounted dressing apparatuses onto an outer radial segment of the rotating polishing pad. A pad dressing apparatus is mounted coaxially encircling each of the substrate supporting heads. The applied compression on the substrate supporting heads urges both substrate and the dressing apparatus against the upper surface of the polishing pad thereon, polishing a substrate while simultaneously dressing the polishing pad.

Claims 1-11 remain in this application.

Reconsideration of the rejection of Claims 1-4 and 8-11 under 35 U.S.C., 103(a), as being unpatentable over Hempel, Jr. (USP 5,895,270 in view of Doan et al (USP 6,004,196), is requested, in light of the following arguments.

As noted by the Examiner, Hempel, Jr. fails to teach a coaxial polishing dressing

head assembly as described in the claimed invention. There are other differences as well. Hempel, Jr. teaches two CMP embodiments, each having multiple polishing and buffing stations. A first embodiment using a vertical processing arrangement and a second using a horizontal processing arrangement. Both use smaller polishing platen diameters inflicting process constraints such as, decreasing the useful life of the polishing pad, while generating heat during polishing because of a smaller diameter polishing platen. Doan, on the other hand, teaches a pad conditioner and polisher, similar in many ways to the claimed invention. However, to modify either of the embodiments taught by Hempel, Jr. with apparatus of Doan et al, is not as obvious as stated. The apparatus of Hempel, Jr. rotates a polishing pad mechanism 76, either in a "X" and "Y" direction, as it rotates, or in an orbital pattern as it rotates to prevent wearing of the polishing pad 18. The total excursion of these motions must be small since the mismatch between the rotating semiconductor device 22 and orbiting polishing pad 18 is minimized to accommodate multiple semiconductor device stations 64.

This contrasts with the claimed invention in which a coaxial polishing-dressing apparatus as claimed in amended Claim 1, lines 5-18, a polishing-dressing head for a polishing apparatus that includes a plurality of substrate head assemblies. Each having a lower nesting surface opposed to an upper surface of a polishing pad. The lower nesting surface releasably holds a substrate to be polished while rotating along a central axis and polishing the substrates on an outer radial portion of the rotating polishing pad.

More importantly, annular dressing rings for dressing the polishing pad are

positioned coaxially encircling each nested substrate. The annular dressing rings are removably attached to the lower surface of the substrate head assemblies. This embodiment provides for a concurrent application of pressure, for simultaneous polishing of the substrate and dressing the polishing pad by urging the substrate head assemblies against the upper surface of the rotating polishing pad.

The annular dressing rings of claim 1, and the manner in its application as illustrated in Figs. 4, 5 and 6, are neither taught nor suggested by the prior art.

Reconsideration of the rejection of Claims 5 and 7 under 35 U.S.C., 103(a), as being unpatentable over Hempel, Jr. (USP 5,895,270 in view of Doan et al., in further view of Shimizu et al. (USP6,176,762) is requested, in light of the following arguments.

The arguments of Hempel, Jr., Doan et al., were presented above. As noted by the Examiner, neither teaches a dresser ring comprising ceramic Shimizu et al., are directed towards the cutting of a ceramic base plate. Shimizu et al. bonds a ceramic base plate to one end of a supporting plate while dressing the supporting plate and the ceramic base plate, simultaneously cutting the supporting plate to a certain depth. This process describes a machining technique analogous to that practiced in a machine shop.

The annular dressing rings of claim 1, and the manner in its application as illustrated in Figs. 4, 5 and 6, are neither taught nor suggested by the prior art.

Reconsideration of the rejection of Claim 6 under 35 U.S.C., 103(a), as being

unpatentable over Hempel, Jr., Doan et al., and Shimizu et al. (USP6,176,762), as applied in claims 5 and 7 above, as evidenced by Erickson (USP 6,080,216) is requested, in light of the following arguments.

The arguments of Hempel, Jr., Aiyer and Shimizu were presented above. As noted by the Examiner, neither teaches a glass frit binder. The use of inclusions of a glass frit binder in a ceramic substrate to construct an annular dressing ring is an engineering application taught in materials science courses. Erickson teaches a co-extrusion process to form an alumina-based abrasive material from at least two different liquid colloidal dispersions.

This contrasts with the claimed invention in which a coaxial polishing-dressing apparatus as claimed in amended Claim 1, lines 5-18, which includes a plurality of coaxial polishing-dressing head assemblies each having a lower nesting surface opposed to an upper surface of the polishing pad on the polishing platen, a nesting means releasably holding a substrate to be polished, the coaxial assembly rotates along a central axis thereof, while pressing the substrates on a radial portion of the rotating polishing pad. Dressing rings for dressing the polishing pad are positioned coaxially encircling each nested substrate, the dressing rings are removably attached to the lower surface of a plurality of substrate nesting support heads, with compressing means for applying a polishing and dressing pressure to the coaxial polishing-dressing head assemblies. The substrate polishing-dressing head assemblies are pressed against the upper surface of the polishing pad.

The annular dressing rings of claim 1-11, and the manner of its application as illustrated in Figs. 4, 5 and 6, are neither taught nor suggested by the prior art.

Furthermore, it is respectfully suggested that the combination of these references cannot be made without reference to Applicant's own invention. None of the applied references address the problem of increasing machine throughput by consolidating substrate polishing with pad dressing while doing it simultaneously with a plurality of wafer supporting head assemblies. Applicant has claimed his process in detail. The processes of Figs. 3-6 (Claims 1-11) are believed to be novel and patentable over the various references, because there is not sufficient basis for concluding that the combination of claimed elements would have been obvious to one skilled in the art. That is to say, there must be something in the prior art or line of reasoning to suggest that the combination of these various references is desirable. We therefore request Examiner MacArthur to reconsider her rejection in view of these arguments.

Applicant respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

By 

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